1-21. (Withdrawn)

22. (Original) A mirror assembly for use in an optical scanner having a substantially vertical aperture and a substantially horizontal aperture, comprising:

a first set of pattern mirrors including at least primary and secondary mirrors, and at least one tertiary mirror;

a second set of pattern mirrors including at least primary, secondary, and tertiary mirrors;

a third set of pattern mirrors including at least primary and secondary mirrors;

wherein each of the primary mirrors of the first set being disposed to receive an incident light beam at an oblique angle to reflect the incident beam onto at least one of the secondary mirrors of the first set;

wherein each of the secondary mirrors of the first set being disposed to receive an incident light beam at an oblique angle to reflect the incident beam onto at least one of the tertiary mirrors of the first set;

wherein the tertiary mirror of the first set being disposed at an oblique angle with respect to an incident light beam from at least one of the secondary mirrors of the first set, and positioned to reflect the incident beam outwardly and downwardly through said substantially vertical aperture;

wherein each of the primary mirrors of the second set being disposed to receive an incident light beam at an oblique angle to reflect the incident beam onto at least one of the secondary

mirrors of the second set;

wherein each of the secondary mirrors of the second set being disposed to receive an incident light beam at an oblique angle to reflect the incident beam onto at least one of the tertiary mirrors of the second set;

wherein each of the tertiary mirrors of the second set being disposed at an oblique angle with respect to an incident light beam from at least one of the secondary mirrors of the second set, and positioned to reflect the incident beam through said substantially vertical aperture;

wherein each of the primary mirrors of the third set being disposed to receive an incident light beam at an oblique angle to reflect the incident beam onto at least one of the secondary mirrors of the third set;

wherein each of the secondary mirrors of the third set being disposed to receive an incident light beam at an oblique angle to reflect the incident beam through said substantially horizontal aperture;

wherein the primary mirrors of the first set include a plurality of generally trapezoidal mirrors;

wherein the secondary mirrors of the first set operate to receive a light beam from said generally trapezoidal mirrors; and

wherein the tertiary mirror of the first set is a generally trapezoidal mirror which operates to receive a light beam from said secondary mirrors of the first set.

23. (Original) A mirror assembly for use in an optical scanner having a substantially horizontal aperture and a substantially vertical aperture, comprising:

a first set of pattern mirrors including at least primary and secondary mirrors, and at least one tertiary mirror;

a second set of pattern mirrors including at least primary, secondary, and tertiary mirrors;

a third set of pattern mirrors including at least primary and secondary mirrors;

a source of light beams;

wherein the primary mirrors of the first set are disposed at oblique angles with respect to an incident light beam from said source, to reflect the light beam onto the secondary mirrors of the first set;

wherein the secondary mirrors of the first set are disposed at oblique angles with respect to an incident light beam from said source, to reflect the light beam onto the tertiary mirror of the first set;

wherein the tertiary mirror of the first set is disposed at oblique angles with respect to an incident light beam from the secondary mirrors of the first set, and positioned to reflect light outwardly and downwardly through said substantially vertical aperture;

wherein the primary mirrors of the second set are disposed at oblique angles with respect to an incident light beam from said source, to reflect light onto the secondary mirrors of the second set;

wherein the secondary mirrors of the second set are disposed at oblique angles with respect to an incident light beam from said source, to reflect light onto the tertiary mirrors of the second set;

wherein the tertiary mirrors of the second set are disposed at oblique angles with respect to an incident light beam from the secondary mirrors of the second set, and positioned to reflect light outwardly through said substantially vertical aperture;

wherein the primary mirrors of the third set are disposed at oblique angles with respect to an incident light beam from said source, to reflect light onto the secondary mirrors of the third set;

wherein the secondary mirrors of the third set are disposed at oblique angles with respect to an incident light beam from the primary mirrors of the third set, and positioned to reflect light outwardly through said substantially horizontal aperture;

wherein the primary mirrors of the first set include a plurality of generally trapezoidal mirrors;

wherein the secondary mirrors of the first set operate to receive a light beam from said generally trapezoidal mirrors; and

wherein the tertiary mirror of the first set is a generally trapezoidal mirror which operates to receive a light beam from said secondary mirrors of the first set.

24. (Original) An optical scanner for scanning the surfaces of an object by means of light beams from a substantially vertical aperture and a substantially horizontal aperture, comprising:

a housing having said substantially vertical and horizontal apertures;

a rotating mirror polygon positioned at a predetermined location within an area in said housing;

at least first, second, and third sets of pattern mirrors located within the housing along the periphery of said area;

said first set of pattern mirrors being located in one region along said periphery, and having primary and secondary mirrors, and at least one tertiary mirror for reflecting light beams outwardly and downwardly through said substantially vertical aperture;

said second set of pattern mirrors being located in a similar region along said periphery, and having primary, secondary, and tertiary mirrors for reflecting light beams outwardly through said substantially vertical aperture;

said third set of pattern mirrors being located in a different region along said periphery, and having primary and secondary mirrors for reflecting light beams through said substantially horizontal aperture;

wherein the primary mirrors of the first set include a plurality of generally trapezoidal mirrors;

wherein the secondary mirrors of the first set operate to receive a light beam from said generally trapezoidal mirrors; and

wherein the tertiary mirror of the first set is a generally trapezoidal mirror which operates to receive a light beam from said secondary mirrors of the first set.

25. (Original) An optical scanner as in claim 24, in which said rotating mirror polygon produces light beams that pass radially outward therefrom to scan the primary mirrors of the first set of pattern mirrors, one after another, to scan the primary mirrors of the second set of pattern mirrors, one after another, and to scan the primary mirrors of the third set of pattern mirrors, one after another.

26. (Original) An optical scanner as in claim 24, in which said rotating mirror polygon reflects light beams onto the primary mirrors of said first, second, and third sets of pattern mirrors as it rotates.

27. (Original) An optical scanner as in claim 24, in which said rotating mirror polygon reflects light onto the primary mirrors of said first, second, and third sets of pattern mirrors.

28. (Original) A mirror assembly for use in an optical scanner having a substantially vertical aperture and a substantially horizontal aperture, comprising:

a first set of pattern mirrors including at least primary and secondary mirrors, and at least one tertiary mirror;

a second set of pattern mirrors including at least primary, secondary, and tertiary mirrors;

a third set of pattern mirrors including at least primary and secondary mirrors;

a source of light;

the primary mirrors of the first set being disposed at oblique angles with respect to the source of light, to reflect the source of light onto the secondary mirrors of the first set;

the secondary mirrors of the first set being disposed at oblique angles with respect to incident light beams from the primary mirrors of the first set, and positioned to reflect the light beams onto the tertiary mirror of the first set;

the tertiary mirror of the first set being disposed at oblique angles with respect to incident light beams from the secondary mirrors of the first set, and positioned to reflect the light beams outwardly and downwardly through said substantially vertical aperture;

the primary mirrors of the second set being disposed at oblique angles with respect to the source of light, to reflect the source of light onto the secondary mirrors of the second set;

the secondary mirrors of the second set being disposed at oblique angles with respect to the source of light, to reflect the source of light onto the tertiary mirrors of the second set;

the tertiary mirrors of the second set being disposed at oblique angles with respect to incident light beams from the secondary mirrors of the second set, and positioned to reflect the light beams outwardly through said substantially vertical aperture;

the primary mirrors of the third set being disposed at oblique angles with respect to the source of light, to reflect the source of light onto the secondary mirrors of the third set;

the secondary mirrors of the third set being disposed at

oblique angles with respect to the source of light, to reflect the source of light beams through said substantially horizontal aperture; and

the primary mirrors of the first set including two pairs of opposite side mirrors.

29. (Original) A mirror assembly as in claim 28, wherein

the secondary mirrors of the first set include opposite groups of three mirrors, wherein each secondary mirror operates to receive a light beam from one of the primary mirrors of the first set.

30. (Original) A mirror assembly as in claim 28 in which

at least two of the secondary mirrors of the first set operate to receive a light beam from a common primary mirror of the first set.

31. (Original) An optical scanner as in claim 28, in which

the source of light includes a rotating mirrored surface that directs light onto the primary mirrors of said first, second, and third sets of pattern mirrors as it rotates.

32. (Original) An optical scanner as in claim 28, in which

the source of light includes a rotating polygon with mirrors on each its sides to reflect light onto the primary mirrors of said first, second, and third sets of pattern mirrors.

33-35. (Withdrawn)

36. (Previously presented) An optical scanner comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets receiving the laser beam and rotating to reflect the laser beam in a plurality of directions as the spinner rotates,

the reflected laser beam striking the pattern mirrors to produce a plurality of scanning beams including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams;

a first group of pattern mirrors reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan lines and for reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines;

a second group of pattern mirrors reflecting the third group of scanning beams through the second aperture to produce a

third scan pattern consisting of a plurality of intersecting scan lines; and

the reflected laser beam from the spinner alternatingly striking at least one pattern mirror of the first group and then at least one pattern mirror of the second group, and repeating this alternating operation multiple times as the beam is reflected from a single facet of the spinner during a single rotation of the spinner, to reflect scanning beams alternatingly and repetitively through the first and second apertures as the spinner rotates a single rotation.

37. (Previously presented) An optical scanner comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets receiving the laser beam and rotating to reflect the laser beam in a plurality of directions as the spinner rotates, to cause the beam to strike the pattern mirrors to produce a plurality of scanning beams including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams;

a first group of pattern mirrors reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan lines and for reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines; and

a second group of pattern mirrors reflecting the third group of scanning beams through the second aperture to produce a third scan pattern consisting of a plurality of intersecting scan lines;

the first group of pattern mirrors including a plurality of pattern mirrors spaced apart from one another and located between the polygon spinner and the second group of pattern mirrors, and

the polygon spinner directing the laser beam alternatingly at the pattern mirrors of the first group that are spaced apart and through the spaces between those pattern mirrors to reach the pattern mirrors of the second group as the polygon spinner rotates.

38. (Previously presented) An optical scanner as in claim 37, wherein:

the pattern mirrors of the first group that are spaced apart reflect the beams to other pattern mirrors and then through the first aperture.

39. (Previously amended) An optical scanner comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets receiving the laser beam and rotating to reflect the laser beam in a plurality of directions as the spinner rotates to cause the beam to strike at least certain of the pattern mirrors to produce a plurality of scanning beams including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams;

a first group of pattern mirrors for reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan lines and for reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines; and

a second group of pattern mirrors for reflecting the third group of scanning beams through the second aperture to produce a third scan pattern consisting of a plurality of intersecting scan lines;

wherein multiple facets of the polygon spinner direct the laser beam alternatingly multiple times, during each rotation of the polygon spinner, to at least one pattern mirror of the first group and then to at least one pattern mirror of the second group, to reflect the laser beam alternatingly through the first and second apertures multiple times as the polygon spinner rotates a single rotation.

40. (Previously presented) An optical scanner for scanning at least the top, bottom and three sides of an article comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets receiving the laser beam and rotating to reflect the laser beam to produce a single reflected beam directed in a plurality of directions as the spinner rotates, to produce a plurality of scanning beams including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams; and

a first group of pattern mirrors reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan

lines and for reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines;

the first group of pattern mirrors including mirrors positioned adjacent to first aperture, at least one of which is angled to reflect scanning beams of the first group outwardly and downwardly to scan the top of an article, and other mirrors angled to reflect scanning beams of the second group diagonally laterally to scan the leading and trailing sides of the article; and

a second group of pattern mirrors reflecting the third group of scanning beams through the second aperture to produce a third scan pattern consisting of a plurality of intersecting scan lines;

the first group of pattern mirrors including a plurality of pattern mirrors spaced apart from one another and located between the polygon spinner and the second group of pattern mirrors.

41. (Previously presented) An optical scanner comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets for reflecting the laser beam to produce a single reflected beam in a plurality of directions as the spinner rotates to cause the beam to strike at least some of the pattern mirrors, to produce a plurality of scanning beams including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams; and

a first group of pattern mirrors including a first, second and third subsets of pattern mirrors for reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan lines,

a second group of pattern mirrors including a first, second and third subsets of pattern mirrors reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines; and

a third group of pattern mirrors for reflecting the third group of scanning beams through the second aperture to produce a third scan pattern consisting of a plurality of intersecting scan lines;

the first group of scanning beams reflecting off multiple mirrors of the first subset of pattern mirrors of the first group to the second subset thereof, then reflecting off multiple mirrors of said second subset to the third subset thereof, and

then off at least one mirror of said third subset out the first aperture,

the second group of scanning beams reflecting off multiple mirrors of the first subset of pattern mirrors of the first group to the second subset thereof, then reflecting off multiple mirrors of said second subset to the third subset thereof, and then off at least one mirror of said third subset out the first aperture.

42. (Previously presented) An optical scanner as in claim 41, wherein

the third subset of mirrors in the second group includes multiple mirrors and the scanning beams from the second subset of the second group reflect off multiple mirrors of the second group and then pass out the first aperture.

43. (Previously presented) An optical scanner comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets for reflecting the laser beam in a plurality of directions as the spinner rotates to

produce a plurality of scanning beams including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams; and

a first group of pattern mirrors including a first, second and third subsets of pattern mirrors for reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan lines,

a second group of pattern mirrors including a first, second and third subsets of pattern mirrors reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines, each of the subsets of the second group having multiple mirrors; and

a third group of pattern mirrors for reflecting the third group of scanning beams through the second aperture to produce a third scan pattern consisting of a plurality of intersecting scan lines;

the first group of scanning beams reflecting off the first subset of pattern mirrors of the first group to the second subset thereof, then reflecting off said second subset to the third subset thereof, and then off said third subset out the first aperture,

the second group of scanning beams reflecting off the first subset of pattern mirrors of the first group to the second subset

thereof, then reflecting off said second subset to the third subset thereof, and then off said third subset out the first aperture,

at least one of the mirrors of the first group of pattern mirrors being positioned adjacent the first aperture to reflect certain of the first group of scanning beams outwardly through the first aperture to scan the side of an article,

at least one of the mirrors of the second group of pattern mirrors being positioned adjacent the first aperture and angled to reflect certain of the first group of scanning beams outwardly and laterally through the first aperture toward the leading side of the article, and at least one positioned adjacent the first aperture and angled to reflect certain of the first group of scanning beams outward and laterally through the first aperture to scan the trailing side of the article, and

at least one of the mirrors of the first group of pattern mirrors being positioned adjacent the first aperture and angled to reflect certain of the first group of scanning beams downwardly and outwardly through the first aperture to scan the top of an article.

44. (Previously presented) An optical scanner comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of pattern mirrors, including a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets receiving the laser beam and rotating to reflect the laser beam to produce a single reflected beam directed in a plurality of directions as the spinner rotates, the reflected beam striking the pattern mirrors to produce a plurality of scanning beams, including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams; and

a first group of pattern mirrors reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan lines and for reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines; and

a second group of pattern mirrors reflecting the third group of scanning beams through the second aperture to produce a third scan pattern consisting of a plurality of intersecting scan lines;

the first group of pattern mirrors include a plurality of mirrors, at least one of which is positioned and angled to reflect incident laser beams outwardly to scan the side of an article, at least a second of which is positioned and angled to

reflect incident laser beams downward toward the top of an article, at least a third mirror of which is positioned and angled to reflect an incident laser downwardly and rearwardly to scan the leading edge of an article, and at least a fourth of which is positioned and angled to reflect an incident beam downwardly and forwardly to scan the trailing edge of an article.

45. (Previously presented) An optical scanner as in claim 9 wherein:

the second group of pattern mirrors includes at least one mirror positioned and angled to reflect an incident beam in a substantially vertical direction to scan the bottom of the article and at least one mirror is positioned and angled to reflect an incident beam rearwardly to scan the forward side of the article.

46. (Previously amended) A method of scanning an item having a bar code from multiple directions, comprising the steps of

generating laser light;

providing a single multi-faceted mirrored polygon in a path of said laser light;

rotating the mirror polygon and directing the laser light at the polygon, as it is rotating, to produce a single laser beam reflected off each facet of the polygon;

generating a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams by reflecting said laser light off said mirror polygon and then reflecting the laser beam off groups of pattern mirrors;

generating the first group of scanning beams comprises directing the laser beam to a first set of pattern mirrors, reflecting the beam from those mirrors to a second set of pattern mirrors and reflecting the beam from those mirrors to at least one additional pattern mirror;

directing said first group of scanning beams from said at least one additional mirror through a first transparent member oriented in a first plane to scan a surface of the item from one orthogonal direction to scan at least the top of an item;

generating the second plurality of scanning beams comprises directing the laser beam to a third set of pattern mirrors, reflecting the beam from those mirrors to a fourth set of pattern mirrors and reflecting the beam from those mirrors to a fifth set of pattern mirrors;

directing said second group of scanning beams from at least one mirror of said fifth set of mirrors directly outwardly through the first transparent member oriented in the first plane to scan one side of the item and from further mirrors of said fifth set of mirrors diagonally outwardly through the first transparent member oriented in the first plane to scan the item from a diagonal direction to scan the leading and trailing sides

of the item; and

generating the third plurality of scanning beams comprises directing the single laser beam to a sixth set of pattern mirrors, reflecting the beam from those mirrors to a seventh set of pattern mirrors and reflecting the beam from the mirrors of the seventh set,

directing said third group of scanning beams from said seventh set of mirrors through a second transparent member oriented in a second plane orthogonal to said first plane to scan the item from another orthogonal direction to scan at least the bottom of the item.

47. (Previously amended) A method of scanning as in Claim 46 wherein

the first group of scanning beams is directed through the first transparent window in an outwardly and downwardly direction to scan the top of an item, and

the second group of scanning beams is directed through the first transparent window in at least a diagonally rearward direction and a diagonally forward direction to scan the leading and trailing sides of an item.

48. (Previously amended) A method of scanning as in claim 47 wherein

certain of the beams of the second group are directed through the first transparent window in a diagonally rearward direction to scan the leading side of an item, other beams of the second group are directed through the first transparent window in a diagonally forward direction to scan the trailing side of an item and other beams of the second group are directed outwardly through the first transparent window in a generally lateral direction to scan the side of the item.

49. (Previously presented) A method of scanning as in claim 46 where

at least certain of the third group of scanning beams is generated by directing the beam from the polygon between mirrors of either the first or second set to the mirrors of the sixth set.

50. (Previously presented) A method of scanning as in claim 46 wherein

scanning beams are directed through the first transparent window and through the second transparent window alternatingly, and this alternative operation occurs repeatedly, for beams originating from a single facet of the polygon, during each rotation of the polygon.

51. (Previously presented) A method of scanning as in claim 46 wherein

generating laser light comprises

generating a single laser beam, and only said single laser beam is reflected off each of the facets of the polygon.

52. (Previously presented) A method of scanning an item having a bar code from multiple directions, comprising the steps of

generating laser light in the form of a single laser beam;

providing a single multi-faceted mirrored polygon in a path of said single laser light beam;

rotating the mirror polygon and reflecting the single laser beam from each of the facets of the polygon, as the polygon is rotating, to form from the single laser beam a plurality of scanning beams that pass through both horizontal and vertical transparent members;

generating a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams by reflecting said laser beam off said mirror polygon and then off groups of pattern mirrors;

generating the first group of scanning beams comprises directing the laser beam to a first set of pattern mirrors, reflecting the beam from those mirrors to a second set of pattern mirrors and reflecting the beam from those mirrors to at least one additional pattern mirror;

directing said first group of scanning beams from said at least one additional mirror through a vertical transparent member oriented in a first plane to scan a surface of the item from one orthogonal direction;

generating the second plurality of scanning beams comprises directing the laser beam to a third set of pattern mirrors, reflecting the beam from those mirrors to a fourth set of pattern mirrors and reflecting the beam from those mirrors to at least one further mirror;

directing said second group of scanning beams from said at least one further mirror through the vertical transparent member oriented in the first plane to scan the item from a diagonal direction to scan at least one side of the item; and

generating the third plurality of scanning beams comprises directing the laser beam to a fifth set of pattern mirrors, reflecting the beam from those mirrors to a sixth set of pattern mirrors and reflecting the beam from the mirrors of the sixth set,

directing said third group of scanning beams from said sixth set of mirrors through a horizontal transparent member oriented in a second plane orthogonal to said first plane to scan the item from another orthogonal direction.

53. (Previously amended) A method of scanning as in Claim 52 wherein

the first group of scanning beams is directed through the first transparent window in an outwardly and downwardly direction to scan the top of an item, and

the second group of scanning beams is directed through the first transparent window in a diagonally rearward direction to scan the leading side of an item.

54. (Previously amended) A method of scanning as in claim 53 wherein

certain of the beams of the second group are directed through the first transparent window in a diagonally rearward direction to scan the leading side of an item, and other beams of the second group are directed through the first transparent window in a diagonally forward direction to scan the trailing side of an item.

55. (Previously presented) A scanner as in claim 52 wherein

scan lines are directed through the first transparent window and through the second transparent window alternatingly, and this alternative operation occurs repeatedly, for beams originating from a single facet of the polygon, during each rotation of the polygon.

56. (Previously presented) An optical scanner comprising:

a housing having a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

a single laser which produces a laser beam within the housing;

a plurality of groups of pattern mirrors;

a polygon spinner having mirrored facets receiving the laser beam and rotating to reflect the laser beam in a plurality of directions as the spinner rotates,

the reflected laser beam striking the pattern mirrors to produce a plurality of scanning beams including a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams;

a first group of pattern mirrors reflecting the first group of scanning beams through the first aperture to produce a first scan pattern consisting of a plurality of intersecting scan lines and for reflecting the second group of scanning beams through the first aperture to produce a second scan pattern consisting of a plurality of intersecting scan lines;

a second group of pattern mirrors reflecting the third group of scanning beams through the second aperture to produce a third scan pattern consisting of a plurality of intersecting scan lines; and

the polygon spinner having four facets, two of the facets being angled at angles closer to their respective opposite facets than to their two adjacent facets, and

the beam from one pair of opposite facets of the polygon spinner striking one set of mirrors of the first group, and the beam from the other pair of opposite facets striking a different set of mirrors of the first group.

57. (Previously presented) An optical scanner as in claim 56 comprising

a single laser which produces a single laser beam, and

a polygon spinner that receives just the single laser beam.

58. (Previously presented) A method of scanning an item having a bar code from multiple directions, comprising the steps of

generating laser light;

providing a single multi-faceted mirrored polygon in a path of said laser light;

constructing the mirrored polygon to have four facets, two of the facets being angled at angles closer to their respective opposite facets than to their two adjacent facets,

rotating the mirrored polygon and directing the laser light at the polygon, as it is rotating, to produce a laser beam reflected off each facet of the polygon;

generating a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams by reflecting said laser light off said mirrored polygon and then reflecting the laser light off groups of pattern mirrors;

generating the first group of scanning beams comprises directing the laser beam from one pair of opposite facets of the mirrored polygon to a first set of pattern mirrors,

directing said first group of scanning beams from the first set of pattern mirrors through a first transparent member oriented in a first plane to scan a surface of the item from one orthogonal direction;

generating the second plurality of scanning beams comprises directing the laser beam from the second pair of opposite facets of the mirrored polygon to a second set of pattern mirrors,

directing said second group of scanning beams from the second set of pattern mirrors through the first transparent member oriented in the first plane to scan the item from a diagonal direction;

generating the third plurality of scanning beams comprises directing the single laser beam to a third set of pattern mirrors, and

directing said third group of scanning beams from said third set of pattern mirrors through a second transparent member oriented in a second plane orthogonal to said first plane to scan the item from another orthogonal direction.

59. (Previously presented) An optical scanner comprising:

(a) a housing including a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

(b) a laser diode for producing a single laser beam;

(c) an optical transceiver for passing the single laser beam and for collecting reflected light from an article having a bar code label to be scanned;

(d) a spinner having a plurality of sides oriented at different angles with respect to a predetermined reference for reflecting the single laser beam in a plurality of directions to produce a plurality of scanning beams, and for directing light reflected from the article to the optical transceiver; and

(e) a plurality of pattern mirrors for reflecting a first group of the scanning beams in a substantially horizontal direction through the first aperture, a second group of the scanning beams in a substantially downward diagonal direction through the first aperture, and a third group of the scanning beams in a substantially vertical direction through the second aperture and including

(f) a first group of mirrors for reflecting the laser beam from the spinner, a second group of mirrors for reflecting the scanning beam from the first group of mirrors, and a third group of mirrors for reflecting the scanning beam from some of the

mirrors in the second group of mirrors; and

(g) a photodetector for generating signals representing the intensity of the light reflected from the article;

(h) the mirrors of the first group being divided into a first and second set,

(i) the first set being positioned closer to the spinner than the second set,

(j) the spinner directing the laser beam between the mirrors of the first set to strike the mirrors of the second set.

60. (Previously presented) An optical scanner comprising:

(a) a housing including a substantially vertical surface containing a first aperture and a substantially horizontal surface containing a second aperture;

(b) a laser diode for producing a single laser beam;

(c) an optical transceiver for passing the single laser beam and for collecting reflected light from an article having a bar code label to be scanned;

(d) a spinner having a plurality of sides oriented at different angles with respect to a predetermined reference for reflecting the single laser beam in a plurality of directions to produce a plurality of scanning beams, and for directing light reflected from the article to the optical transceiver; and

(e) a plurality of pattern mirrors for reflecting a first group of the scanning beams in a substantially horizontal

direction through the first aperture, a second group of the scanning beams in a substantially downward diagonal direction through the first aperture, and a third group of the scanning beams in a substantially vertical direction through the second aperture and including

(f) a first group of mirrors for reflecting the laser beam from the spinner, a second group of mirrors for reflecting the scanning beam from the first group of mirrors, and a third group of mirrors for reflecting the scanning beam from some of the mirrors in the second group of mirrors; and

(g) a photodetector for generating signals representing the intensity of the light reflected from the article;

(h) the spinner having an even number of facets greater than two, each of the facets being at different angles with respect to a predetermined axis, and the facets opposite one another being disposed at angles closer to one another than to any of the other facets.

61. (Previously presented) As in claim 60, wherein the spinner has four facets.

62. (Previously presented) A method for scanning an article having a bar code label with minimal article orientation comprising the steps of:

(a) generating a single laser beam;

(b) providing a polygon spinner including a plurality of mirrored facets;

(c) reflecting the single laser beam from the polygon spinner at a plurality of pattern mirrors within a scanner housing to produce first, second and third groups of scan lines from the single laser beam;

(d) reflecting the first group of scan lines from the pattern mirrors downwardly through a vertical aperture within the scanner housing to produce a first scan pattern consisting of a plurality of intersecting scan lines,

(e) reflecting the second group of scan lines from the pattern mirrors through said vertical aperture within the scanner housing to produce a second scan pattern consisting of a plurality of intersecting scan lines,

(f) reflecting the third group of scan lines through a horizontal aperture within the scanning housing to produce a third scan pattern consisting of a plurality of intersecting scan lines; and

(g) arranging the spinner to have an even number of facets, with the facets being at different angles with respect to a predetermined axis and with the facets opposite to one another in the spinner being at angles closer to one another than to any of the other facets.

63. (Previously presented) A method of scanning an item having a bar code from multiple directions to effectively scan the bar code when it appears on either the top or bottom of the item or on any of at least three sides thereof, one of the sides facing a customer purchasing the item, comprising the steps of:

generating laser light;

providing a single multi-faceted mirrored polygon in a path of said laser light;

generating a first group of scanning beams, a second group of scanning beams, a third group of scanning beams, and a fourth group of scanning beams, by reflecting said laser light off said mirrored polygon;

directing said first group of scanning beams through a first transparent member oriented in a first plane to scan the surface of the item facing the customer from one orthogonal direction to effectively scan a bar code located on the customer side of the item;

directing said second group of scanning beams through the first transparent member oriented in the first plane to scan the top surface of the item from a diagonal direction to effectively scan a bar code located on the top surface of the item;

directing said third group of scanning beams through the first transparent member oriented in the first plane to scan the item from a diagonal direction to effectively scan a bar code located on the front or back of the item; and

directing said fourth group of scanning beams through a second transparent member oriented in a second plane orthogonal to said first plane to effectively scan a bar code located on the bottom of the item from another orthogonal direction, the method the angle between the first and second planes being about ninety degrees.

64. (Previously presented) The method of scanning an item in claim 63 wherein the first transparent window is substantially vertical and the second transparent window is substantially horizontal.

65. (Previously presented) The method of scanning an item in claim 63 wherein the first and second groups of scanning beams are each directed through the first transparent member to produce a plurality of intersecting scan lines; and

the fourth groups of scanning beams is directed through the second transparent member to produce a plurality of intersecting scan lines.

66. (Previously presented) The method of scanning an item in claim 63 wherein the third group of scanning beams is directed through the first transparent member to produce a plurality of intersecting scan lines.

67. (Previously presented) The method of claim 63 wherein certain of the scanning lines of the fourth group of scanning beams are directed diagonally through said second transparent member to scan the front and back of the item.

68. (Previously presented) The method of scanning an item in claim 63 comprising the further step of:

arranging a first set of at least five mirrors and a second set of at least four mirrors so that the first, second and third groups of scanning beams are reflected from the first set of mirrors to the second set of mirrors and then out the first transparent member;

using one combination of mirrors from the first and second sets to direct the first group of scanning beams through the first transparent member;

using a second combination of mirrors from the first and second sets to direct the second group of scanning beams; and

using a third combination of mirrors from the first and second sets to direct the third group of scanning beams through the first transparent member.

69. (Previously presented) The method of scanning an item in claim 68 comprising:

using at least five of the mirrors of the first set in combination with at least four mirrors of the second set to

direct the first group of scanning beams through the first transparent member.

70. (Previously presented) The method of scanning an item in claim 68 comprising:

using at least four mirrors of the first set in combination with one or more mirrors in the second set to direct the second group of scanning beams through the first transparent member.

71. (Previously presented) The method of scanning an item in claim 68 wherein the scanning beams of the first, second and third groups are each reflected from the first set of mirrors directly to the second set of mirrors, and then reflected from the second set of mirrors directly through the first transparent window.

72. (Previously presented) A method of scanning an item having a bar code from multiple directions to effectively scan the bar code when it appears on either the top or bottom of the item or on at least the side facing a customer purchasing the item, comprising the steps of:

generating laser light;

providing a single multi-faceted mirrored polygon in a path of said laser light;

impinging laser light onto said mirrored polygon;

generating a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams by reflecting said laser light off said mirrored polygon;

directing said first group of scanning beams through a first transparent member oriented in a first plane to produce a plurality of intersecting scan lines to scan the surface of the item facing the customer from one orthogonal direction to effectively scan a bar code located on the customer side of the item;

directing said second group of scanning beams through the first transparent member oriented in the first plane to produce a plurality of intersecting scan lines to scan the top surface of the item from a diagonal direction to effectively scan a bar code located on the top surface of the item; and

directing said third group of scanning beams through a second transparent member oriented in a second plane orthogonal to said first plane to produce a plurality of intersecting scan lines to effectively scan a bar code located on the bottom of the item from another orthogonal direction.

73. (Previously presented) The method of scanning an item in claim 72 further comprising the steps of:

directing certain of the scanning beams of said second group through the first transparent member to produce a plurality of intersecting scan lines to scan the item from a diagonal

direction to effectively scan a bar code located on the front or back of the item, as well as on the customer side.

74. (Previously presented) The method of scanning an item in claim 72 further comprising the step of:

directing certain of the scanning beams of said third group through the second transparent member to produce a plurality of intersecting scan lines to scan the item from a diagonal direction to effectively scan a bar code located on the front or back of the item.

75. (Previously presented) A method of scanning an item having a bar code from multiple directions to effectively scanning the bar code when it appears on either the top or bottom of the item or on at least one side of the item, comprising the steps of:

providing a single multi-faceted mirrored polygon in a scanner housing;

rotating said mirrored polygon;

impinging laser light onto said mirror polygon as it is rotating;

generating a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams by reflecting said laser light off said mirrored polygon as it is being rotated;

directing said first group of scanning beams through a first

transparent member oriented in a first plane to produce a plurality of intersecting scan lines to scan the surface of at least one side of the item from a first orthogonal direction;

directing said second group of scanning beams through the first transparent member oriented in the first plane to produce a plurality of intersecting scan lines to scan the top surface of the item from a diagonal direction to effectively scan a bar code located on the top surface of the item; and

directing said third group of scanning beams through a second transparent member oriented in a second plane at about ninety degrees from said first plane to produce a plurality of intersecting scan lines to effectively scan a bar code located on the bottom of the item from another orthogonal direction.

76. (Previously presented) The method of claim 75 wherein the first group of scanning beams is directed successively to each of the mirrors of a first set of pattern mirrors, reflected successively to each of the mirrors of a second set up of pattern mirrors, and reflected from the second set of pattern mirrors through the first transparent member, and the second group of scanning members is directed successively to selected mirrors of the first set of pattern mirrors, reflected to at least one mirror of the second set, and reflected from said at least one mirror through the first transparent member.

77. (Previously presented) The method of claim 76 wherein the first group of scanning beams is directed successively to at least five mirrors of the first set of pattern mirrors, and then reflected from those pattern mirrors of the first set successively to at least four mirrors of the second set of pattern mirrors.

78. (Previously presented) The method of claim 76 wherein the second group of scanning beams is directed successively to at least three mirrors of the first set of pattern mirrors, and then reflected from those pattern mirrors of the first set successively to at least one mirror of the second set of pattern mirrors.

79. (Previously presented) The method of claim 75 wherein at least one of the scanning beams of the first group is directed diagonally through the first transparent member to produce a plurality of intersecting scan lines to scan the front surface of the item, and at least one of the scanning beams of the first group is directed diagonally through the first transparent member to produce a plurality of intersecting scan lines to scan he back surface of the item.

80. (Previously presented) A method of scanning an item having a bar code from multiple directions to effectively scan the bar

code when it appears on either the top or bottom of the item or on at least one other side of the item, comprising the steps of providing a single multi-faceted mirrored polygon in a scanner housing;

rotating said mirrored polygon;

impinging laser light onto said mirrored polygon as it is rotating;

generating a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams by reflecting said laser light off said mirrored polygon as it is being rotated;

reflecting the first group of scanning beams off a first set of mirrors toward a second set of mirrors;

reflecting said first group of scanning beams from the second set of mirrors through a first transparent member oriented in a first plane to produce a plurality of intersecting scan lines to scan the surface of at least one side of the item from a first orthogonal direction;

reflecting the second group of scanning beams off the first set of mirrors toward the second set of mirrors;

reflecting said second group of scanning beams from the second set of mirrors through the first transparent member oriented in the first plane to produce a plurality of intersecting scan lines to scan the top surface of the item from a diagonal direction to effectively scan a bar code located on

the top surface of the item; and

reflecting said third group of scanning beams off a third set of mirrors toward a fourth set of mirrors and from the second set of mirrors through a second transparent member oriented in a second plane at about ninety degrees from to said first plane to produce a plurality of intersecting scan lines to effectively scan a bar code located on the bottom of the item from another orthogonal direction.

81. (Previously presented) A method of scanning an item as in claim 80 further comprising the step of:

reflecting certain of the first group of scanning beams through the first transparent member in a diagonal direction to produce a plurality of intersecting scan lines to scan the front and back surface of the item.

82. (Previously presented) A method of scanning an item as in claim 81 further comprising the step of:

generating a fourth group of scanning lines and a fifth group of scanning lines off said mirrored polygon, reflecting said fourth group of scanning beams off the first set of mirrors toward the second set of mirrors, and then reflecting them diagonally from the second set of mirrors through the first transparent member to scan the front of the item, and reflecting said fifth group of scanning beams off the first set of mirrors

toward the second set of mirrors, and then reflecting them diagonally from the second set of mirrors through the first transparent member to scan the back of the item.

83. (Previously presented) A method of scanning an item having a bar code from multiple directions, comprising the steps of:

generating laser light;

providing a single multi-faceted mirrored polygon in a path of said laser light;

generating a first group of scanning beams, a second group of scanning beams, and a third group of scanning beams by reflecting said laser light off said mirrored polygon;

directing said first group of scanning beams through a first transparent member oriented in a first plane to scan a side surface of the item from one orthogonal direction to effectively scan a bar code located on the side of the item;

directing said second group of scanning beams through the first transparent member oriented in the first plane to scan the top surface of the item from a diagonal direction to effectively scan a bar code located on the top surface of the item; and

directing said third group of scanning beams through a second transparent member oriented in a second plane orthogonal to said first plane to effectively scan a bar code located on the bottom of the item from another orthogonal direction.

84. (Previously presented) A method of scanning an item as in claim 83 wherein the side surface is scanned with at least twenty scan lines.

85. (Previously presented) A method of scanning an item as in claim 83 wherein the top surface is scanned with at least twelve scan lines.

86. (Previously presented) A method of scanning an item as in claim 83 wherein at least five scan lines per facet of the multi-faceted mirrored polygon are directed through the first transparent member.

87. (Previously presented) A bar code scanning system for scanning the top, bottom and at least one side of an item bearing a bar code, comprising:

a housing having a first window and a second window arranged generally orthogonally to one another, the first window being generally horizontal and the second window being generally vertical;

a first set of pattern mirrors positioned adjacent the first window;

a second set of pattern mirrors positioned adjacent the second window, including first, second, and third subsets of pattern mirrors;

a laser within the housing which produces a laser beam;

a single scanning means within the housing comprising a mirror polygon; and

a motor for rotating the mirror polygon;

wherein said mirror polygon reflects a first group of scanning beams across the first set of pattern mirrors and out the first window, reflects a second group of scanning beams across the first and third subsets of pattern mirrors and out the second window, and reflects a third group of scanning beams across the second and third subsets of pattern mirrors and out the second window;

the first group of scanning beams being reflected out the first window by the first set of pattern mirrors to strike the bottom surface of the item;

the second group of scanning beams being reflected out the second window by the first and third subsets of pattern mirror to strike the top surface of the item; and

the third group of scanning beams being reflected out the second window by the second and third subsets of pattern mirrors to strike at least one side of the item.

88. (Previously presented) A bar code scanning system as in claim 87 wherein the first window is a planar horizontal surface and the second window is a planar vertical surface, the angle between the planes being about ninety degrees.

89. (Previously presented) A bar code scanning system as in claim 87 wherein wherein at least twenty scan lines are reflected out the first window and at least twenty scan lines are deflected out the second window.

90. (Previously presented) A bar code scanning system as in claim 87 further including a housing having a first housing section and a second housing section connected at proximate ends forming a generally L-shaped structure the first window being located in the first housing section and the second window located in the second housing section.

91. (Previously presented) A bar code scanning system as in claim 87 wherein the mirror polygon has an axis and mirrored sides, each mirrored side being at a different angle with respect to the axis of the polygon.

92. (Previously presented) A bar code scanning system as in claim 91 wherein the mirror polygon has four mirrored sides, the difference in the angles of the first and third sides being about the same as the difference in the angles of the second and fourth sides.

93. (Previously presented) The mirror assembly as in claim 28 wherein the first set of mirrors includes three tertiary mirrors.

94. (Previously presented) The mirror assembly as in claim 93 wherein at least two of the tertiary mirrors of the first set of mirrors reflect light beams downwardly through the substantially vertical aperture.

95. (Previously presented) The mirror assembly as in claim 28 wherein the mirror assembly is for scanning bar codes on articles, and the light reflected downwardly through the substantially vertical window from the tertiary mirrors of the first set scans a bar code on the top surface of an article.

96. (Previously presented) The mirror assembly as in claim 95 wherein
the light reflected downwardly produces beams that intersect one another.

97. (Previously presented) The mirror assembly as in claim 96 wherein the light beams from the substantially vertical aperture scan the top and customer side of the article, and the light beams from the substantially horizontal aperture scan the bottom of the article and its leading and trailing sides.

98. (Previously presented) The mirror assembly as in claim 28 wherein the mirror assembly includes at least six primary mirrors, at least five secondary mirrors and at least four tertiary mirrors said at least six primary mirrors reflecting light to said at least five secondary mirrors, and said at least five secondary mirrors reflecting light to said at least four tertiary mirrors.

99. (Previously presented) The mirror assembly as in claim 28 wherein the light source includes at least one laser, further including a mirrored polygon having at least three sides, each side having a mirrored surface and being disposed at an angle from the axis of the polygon different than the angle of the other two sides, and wherein the tertiary mirrors of the first and second sets of mirrors receive light that has been reflected from the mirrored polygon and produce at least six scan lines through the substantially vertical aperture during each rotation of the mirrored polygon.

100. (Previously presented) The mirror assembly as in claim 99 having just a single substantially vertical aperture and just a single substantially horizontal aperture, further including a housing having a first housing section and a second housing section connected at proximate ends forming a generally L-shaped structure, the substantially vertical aperture being located in

the first housing section and the substantially horizontal aperture being located in the second housing section.

101. (Previously presented) The mirror assembly as in claim 98 wherein the source of light includes at least two lasers.